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Ocean Dynamics: Vietnam DRI

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award N00014-12-1-0635

LONG-TERM GOALS

To gain a more complete understanding of ocean dynamical processes, particularly at fine-scale, through comparison of high, mid- and low-latitude observations, near the sea surface, in the main thermocline, and near the sea floor.

OBJECTIVES

To identify the phenomena involved in the cascade of energy from meso-scales to turbulent scales. In particular, we wish to quantify the relationship between fine-scale background conditions and the occurrence of microscale breaking.

APPROACH

Progress is achieved through a steady-state cycle of instrument development, field observation and data analysis. The primary instruments employed include Doppler sonar and rapidly-profiling CTD's. Our instruments produce information that is quasi-continuous in space and time, typically spanning two decades in the wavenumber domain. This broad band space-time coverage enables the investigation of multi-scale interactions.

WORK COMPLETED

Our major accomplishment has been participation, along with other DRI PIs, in the negotiation process that will allow a UNOLS research vessel to work in Vietnamese waters in Spring 2013. This is planned to be an educational cruise, primarily. We are preparing a Wirewalker profiling float (Figure 1) and a Livewire power-generating float (Figure 2) for the educational deployments on the spring cruise. The cruise will provide the first opportunity to test a Livewire in open ocean conditions. Conditions in the Vietnam East Sea can be contrasted with those on the Equator in Dynamo (Figures 3,4).

Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE 30 SEP 2013		2. REPORT TYPE		3. DATES COVERED 00-00-2013 to 00-00-2013	
4. TITLE AND SUBTITLE Ocean Dynamics: Vietnam DRI				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) University of California San Diego, Scripps Institution of Oceanography, Marine Physical Laboratory, La Jolla, CA, 92093				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 4	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



Figure 1. A Macro WW being deployed in the Dynamo experiment.

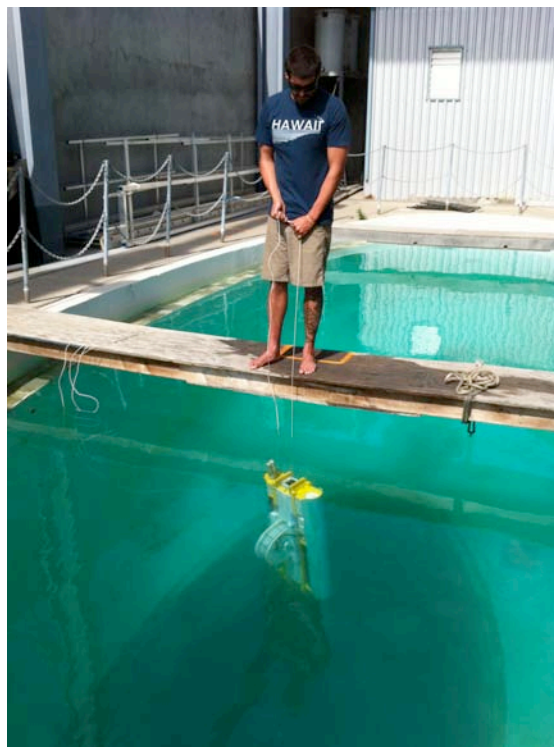


Figure 2. A Livewire power-generating float being tested at SIO. This first-generation device produces nearly 1 W in calm conditions. It is hoped that future devices will produce 1-5 W in typical oceanic conditions.

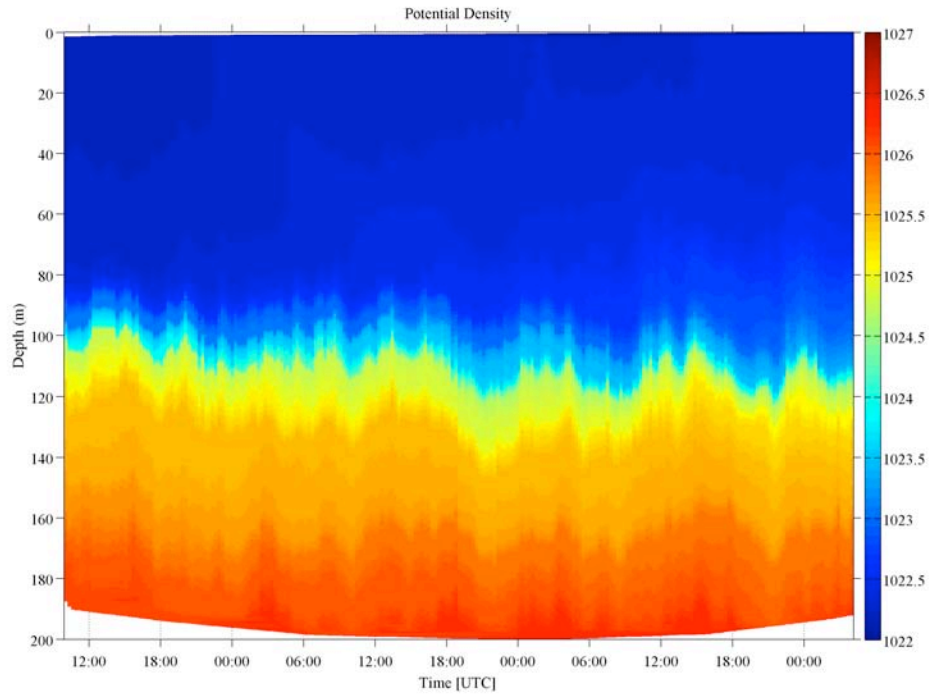


Figure 3. Potential density from a free-drifting MacroWW. Tidal and higher frequency internal waves are present. There is also complex density structure in the mixed layer, poorly seen in this color contouring. (San Nguyen)

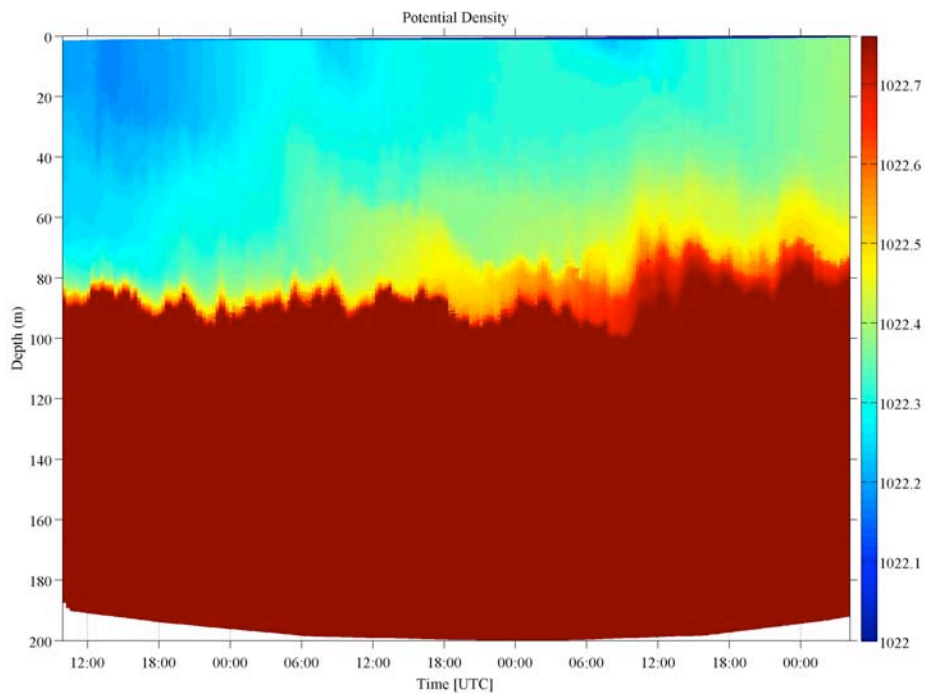


Figure 4. A re-plot of Figure 2 with the color map featuring mixed layer structures. Data are from Buoy 2, WW#5. (San Nguyen), taken on the equator in the Indian Ocean as an aspect of the Dynamo Experiment.

RESULTS

None so far.

IMPACT/APPLICATIONS

If the Spring 2013 cruise is successful, it will pave the way for coming Winter and Summer 2014 data collection cruises off Vietnam on a UNOLS vessel. It is planned to use Wirewalker / Livewire technology extensively on the summer 2014 cruise.

TRANSITIONS

Following the 2013 cruise, two macro-Wirewalker systems will be tested and provided to Vietnamese science teams.

Our group has been developing the “macro” and “mini” Wirewalkers, as well as the “Livewire” wave-powered electrical generator. A number of these devices are planned for use in the coming ONR Vietnam and Sri-Lanka DRIs. The technology has been transitioned.

The first commercial Wirewalker vehicles are now being produced and sold by Brooke Ocean Technology, US.

RELATED PROJECTS

Sri-Lanka DRI, in planning

PUBLICATIONS

Pinkel, R., M. A. Goldin, J. A. Smith, O. Sun, A. Aja, M. N. Bui, T. Hughen. The Wirewalker, a vertically profiling instrument package powered by ocean waves. J Atmospheric and Oceanic Tech., 2010.

Smith, J.A., R.Pinkel, M.Goldin, O.Sun. S, Nguyen, T.Hughen, M. Bui, and T.Aja. Wirewalker Dynamics. J Atmospheric and Oceanic Tech., 2011.

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